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NOTES ON NORTH AMERICAN WILLOWS. II¹

CARLETON R. BALL

(WITH THREE FIGURES)

The first paper² in this series dealt with four western willows, including two new species, one new variety, and one new combination. The present paper contains one new species (§ PHYLLICIFOLIAE) and descriptions of typical *Salix sessilifolia* Nutt. and of the plant which is usually described in manuals of botany under that name.

The writer wishes to acknowledge here the courteous assistance of Professor C. V. PIPER in communicating his notes on the types of NUTTALL'S *Salix sessilifolia* and other species in § LONGIFOLIAE, studied by him at the British Museum. The same acknowledgement is gladly given to Dr. C. F. MILLSPAUGH of the Field Museum and to Dr. B. L. ROBINSON of the Gray Herbarium, and to their associates, for the loan of material representing the species discussed.

Salix pennata, n. sp. (fig. 1).—Low shrub with dark, divaricate, stoutish, glabrous branchlets and large chestnut buds; leaves obovate or elliptic-obovate, 3–6 cm. long, acute, narrowed at base, entire, very dark green above, glaucous beneath, the raised midrib and parallel primary veins conspicuous beneath, glabrous; aments

¹ Since the above was in press the writer has collected true *S. sessilifolia* Nutt. on the Umpqua River at Roseburg, Oregon, and on the Willamette River at Corvallis, Oregon. In both localities it was very abundant, and associated with *S. bolanderiana* Rowlee. It was not found around Portland nor along the Willamette River and adjacent sloughs for a distance of about 15 miles below Portland, including part of the famous Sauvie's Island. The species here treated as *S. fluviatilis* Nutt. is a common plant about Portland, from Ross Island, 2 miles above the city, to Sauvie's Island, some 15 miles below. It is the dominant willow at the Dalles, Oregon, just east of the Cascade Mountains. Both here and on the lower Willamette it apparently is the only species of the *Longifoliae*.

² BALL, CARLETON R., Notes on North American willows. I. BOT. GAZ. 40:376–380. pls. 12, 13. 1905.



FIG. 1.—*Salix pennata* Ball: a portion of the pistillate type (*Suksdorf* 15 from Mt. Adams) in Bebb Herb., Field Museum of Natural History; nat. size.

sessile, stout; pistillate 2.5–7 cm. long; capsule subsessile, 6–8 mm. long, densely silvery pubescent; style about 1.4 mm. long, stigmas long; scales obovate, acute, black, densely pilose; stamens 2, filaments glabrous, free.

Low shrub, probably about 0.5–1 m. in height, of spreading habit; bark (probably) dark gray to brownish, branchlets stoutish, divaricate or somewhat virgate, dark brown to black, dull or somewhat shining; smooth or sometimes longitudinally finely wrinkled, glabrous throughout; buds mid-sized to large, 6–10 mm. long, ovate, apiculate, chestnut, glabrous.

Leaves usually exstipulate, petiolate; stipules wanting on fruiting branchlets, on one sterile shoot (*Applegate* 2758) 4–8 mm. long, lanceolate to semicordate, acute; petioles slender to stoutish, 5–10 mm. long, greenish yellow or becoming brown, glabrous; blades on fruiting branchlets narrowly to broadly obovate or obovate-oval, acute to abruptly acute at the apex, cuneate to acute at the base, 3–6 cm. long, 1.5–3.5 cm. wide, common sizes being 4 by 2, 5 by 2.5–3, and 6 by 2.5–3.4 cm., those on luxuriant sterile twigs elliptic-oblong to elliptic-oval or even elliptic-oblong, larger, 4–8 cm. long, 1.5–3.8 mm. wide, the narrowest 7 by 1.5, the widest 8 by 3.8 cm., all entire or distal leaves on sterile twigs crenate or crenulate, dark green and somewhat shining above, strongly glaucous beneath, midvein and primary veins rather prominent above, strongly so beneath, where the secondaries make a strong reticulation, the primaries simple, parallel, glabrous throughout or the under surface sparsely sprinkled with short shining hairs.

Aments precocious, stout, sessile, ascending or spreading, loosely to closely arranged on the branchlet, the staminate naked, the pistillate subtended by 1 or 2 very small, scalelike leaves, the peduncle in fruit becoming 2–5 mm. long.

Pistillate aments 2.5–5 cm. long in flower, becoming 3–7 cm. long in fruit, 1.2–2 cm. wide; capsule 6–8 mm. long, narrowly lanceolate-rostrate, acute, subsessile, densely pubescent with silvery white hairs; pedicel stout, 0.2–0.4 mm. long, pubescent; style 1.2–1.5 mm. long, entire, brown; stigmas 0.4–0.6 mm. long, mostly divided; scales in both sexes narrowly obovate, acute or obtusish,

1.2-1.5 mm. long, black, densely clothed on both surfaces with long, straight, shining, white or yellowish hairs.

Staminate aments stout, sessile, 2.5-3 cm. long; stamens 2, filaments slender, 6-8 mm. long, glabrous, free, anthers short, oval; scales as described or somewhat narrower, hairs white or flavescent.

Salix pennata (fig. 1) is easily one of the most beautiful species of § PHYLICIFOLIAE. In relationship it lies between *S. chlorophylla* and *S. pulchra*. Geographically, also, it occupies a position between these two species. It is abundantly distinguished from both. From *S. chlorophylla* it is separated by the much larger and darker leaves, obovate rather than elliptical, with their conspicuous parallel primary veins, especially on the lower surface, and by the longer aments and capsules. From *S. pulchra* it may be distinguished by much the same series of characters. While *S. pulchra* also has large leaves, they are more rhombic-oblancoate than obovate in outline, always bright and shining green above and less strikingly veined. The stipules in that species also are linear-lanceolate, glandular, and very persistent. Owing to the cold and wet situations in which it occurs, *S. pennata* is a late-flowering species. All the specimens bearing flowers were collected in July, while fruit may be found well into August.

Our species is also an interesting example of apparently restricted distribution. So far, collections have come only from the two great peaks of the central Cascades, Hood and Adams, which face each other across the gorge of the Columbia. Further search may reveal the species on Jefferson and Rainier. The specimen collected by SUKSDORF in Skamania County, Washington, on July 31, 1883, and the battered, fragmentary specimen of the Wilkes Expedition are somewhat doubtfully referred here. Both have leaves more nearly oblanceolate than obovate, but otherwise they have the characters of our species. *S. chlorophylla* and *S. nelsoni* have never been found in the Cascades, though little *S. monica* is found in the central Sierra Nevada.

SPECIMENS EXAMINED.—OREGON: Marion County: 10 miles west of Olay Butte, in alder swamp at head of a canyon, *E. I. Applegate* 2758, Sept. 4, 1898 (N); north base of Olay Butte, in wet meadow, alt. 4000 ft., *Applegate* 2766, Sept. 6, 1898 (N); Clackamas County: edge of swamp, 10 miles north of Olay Butte, alt. 4000 ft., *Applegate* 2770, Sept. 6, 1898 (N); vicinity of Mt. Hood: in swamp, north base of Mt. Hood, *Thomas Howell*, Oct. 2, 1886 (FBb); Government Camp, Mt. Hood, edge of wet meadow, *E. I. Applegate* 2801, Sept. 12, 1898 (N); *F. A. Walpole* 354, Aug. 28, 1899 (N), growth low, dense, compact, 3-4 ft.; shore of Lost Lake, Mt. Hood, *H. D. Langille* 20, July 6, 1901 (B, N).

WASHINGTON: Mt. Adams and vicinity: Mt. Paddo (Adams), *W. N. Suksdorf*, July 31, 1883 (B, N); mountains of Skamania County, *Suksdorf* 1371, Sept. 6, 1883 (B, N); Mt. Paddo (Adams), *Suksdorf* 15 (pistillate type), 16 (staminate type), 17, July 13, Aug. 12, 1886 (FBb); no locality, U.S. Exploring Expedition under Capt. Wilkes, interior of Washington Territory (N).

SALIX SESSILIFOLIA Nuttall, N.A. Sylva 1:68. 1842; Bebb (in part), Willows of California 85. 1879; not of most authors (fig. 2).



FIG. 2.—*Salix sessilifolia* Nutt.: a portion of the pistillate twig of *Hall* 474 in Gray Herb.; nat. size.

S. sessilifolia var. *villosa* Andersson, Monog. Sal. 56. 1867; Anders. in DC. Prod. 16:214. 1868.

S. macrostachya (in part) as interpreted by ROWLEE, Bull. Torr. Bot. Club 27:250. *pl. 9, fig. 5* (named *S. macrostachya cusickii* in the description of the plate but this variety never published). 1900; not of Andersson.

Shrub 2-3 (or more) m. in height; branchlets slender, the older dark brown, longitudinally striated, the younger yellowish, more or less tomentose, those of the season densely white villous-tomentose with spreading white or gray hairs.

Leaves sessile or subsessile, usually stipulate; stipules ovate to lanceolate, acute, entire or occasionally minutely denticulate; petioles none or 2-4 mm. long on vigorous sterile shoots; blades narrowly to broadly lanceolate or elliptic-lanceolate; the smaller rounded, the larger somewhat narrowed and acute at the base, acute or short-acuminate at the apex, terminating in an extremely sharp spinulose point, 2.5-5 cm. long, 8-15 mm. wide, on vigorous sterile shoots larger, 5-7 cm. long, 15-20 mm. wide, all denticulate to spinulosely denticulate (the spinulose teeth gland-tipped, sometimes 1 mm. in length), green and densely to thinly villous-tomentose with spreading hairs on both sides, especially on the midribs and on very young leaves, not obscuring the green color on fully expanded leaves, only the very youngest silvery white in color.

Aments appearing after the leaves, solitary in the specimens seen, terminal on short leafy branches 1-4 or 5 cm. long and bearing several well developed leaves, or old aments apparently lateral and nearly sessile by the seasonal prolongation of the fruiting branchlet from the bud subtended by the apical leaf.

Pistillate aments dense, 4-6 cm. long, spreading or drooping; rachis densely villous; scales mostly deciduous, broadly elliptic-lanceolate, acute, densely villous-tomentose with gray hairs; capsule lanceolate, acute, 5-6.5 mm. long, villous; style and stigmas together about 1-1.5 mm. long, style apparently 0.5 mm. long (difficult to differentiate style from stigma in old dried material), divided; stigmas about 1 mm. long, divided.

Staminate aments not seen on typical material (on approximately typical specimens they are 3-4 cm. long; scales elliptical, pilose-pubescent; stamens 2, filaments pubescent, free, anthers about 1 mm. long).

The types of NUTTALL'S numerous species in § LONGIFOLIAE have recently been studied by Professor C. V. PIPER at the British Museum. As a result of this examination it appears, among other things, that the type of *Salix sessilifolia* is quite different from the plant usually described under that name by American authors. From the illustration (fig. 2) and from the full redescriptions prepared, the identity of *S. sessilifolia* should be established readily. It is seen to be a plant with the leaves on the fruiting branches small, truly lanceolate, and actually sessile! The leaves and the twigs of the season are densely clad with a pilose tomentum of gray hairs which are spreading on the petiole and midrib and more or less appressed on the blade. The capsule also is densely pilose, even in age. True *S. sessilifolia* belongs, therefore, in the group containing *S. argophylla* and *S. macrostachya* (as these are at present understood) rather than with the *S. fluviatilis-melanopsis* aggregation. Just what are the limits of variation in *S. sessilifolia*, as well as the more certain identification of the relatives named above, cannot be settled at this moment. Further study of NUTTALL'S types and of collections from the type localities will be necessary to a final decision. The plant commonly identified and described as *S. sessilifolia* is here treated provisionally as *S. fluviatilis* Nuttall.

SPECIMENS EXAMINED.—OREGON: *Elihu Hall* 474, in 1871 (FbB 6271, Gray [fig. 2] distributed as *S. desertorum* Richardson; the Gray Herbarium specimen with "*desertorum*" elided and "*S. sessilifolia* var. *villosa*" written in; the specimen in the Bebb Herbarium identified by BEBB as *S. sessilifolia* var. *villosa*; both specimens attested as *S. macrostachya* Nuttall by ROWLEE); *Cusick* (said by ROWLEE to be no. 1514), said by CUSICK (fide PIPER) to have been collected in Linn County, Oregon, probably on the Willamette River (FBb 994).

CALIFORNIA: In most of the Californian specimens having leaves densely villous-tomentose with somewhat spreading gray hairs, instead of villous with appressed silvery hairs, the leaves are much narrower than in the typical *S. sessilifolia*. Such material is found under the names *S. sessilifolia*, *S. argophylla*, and *S. hindsiana*. Two Californian specimens which rather closely approximate true *S. sessilifolia* in habit and in shape, size, and vesture of the leaves are cited below. Their leaves, however, are not so distinctly lanceolate, nor are they spinulose-denticulate so far as observed, but they do possess small stipules. Marin County, *W. H. Brewer* 2360, in 1863 (FBb 6172) or 1866 (G); Nasimento R., *W. H. Brewer* 544, May 3, 1860-1862 (G, on same sheet with the preceding).

J. G. Jack's plant from Grant's Pass, Oregon, Aug. 23, 1904 (G) may represent the glabrate autumnal aspect of the species. The leaves, though broad, are blunter and quite entire. The spinulose teeth may be deciduous, however. *Cusick's* 4497 from Roseburg, Oregon, 1914 (B) is the same as *Jack's* plant, but with densely pilose-tomentose, stipulate, sharply apiculate leaves which are spinulose-denticulate. His no. 4457 differs only in the more linear leaves; both bear foliage only.

SALIX FLUVIATILIS (?) Nuttall, N.A. Sylva 1:73. 1842 (fig. 3).

S. sessilifolia of various authors, as Sargent, Silva N.A. 9:127. pl. 475. 1896; Rowlee, N.A. Willows. I. Longifoliae Bull. Torr. Bot. Club 27:250. pl. 9. fig. 8. 1900; Howell, Fl. N.W. U.S. 618. 1903; not of Nuttall, N.A. Sylva 1:68. 1842.

Shrub, 2-6 and probably 8 m. in height; branchlets slender, brown, longitudinally striated (probably from shrinking in drying), glabrous, those of the season yellowish, often pubescent.

Leaves subsessile or the larger distinctly petiolate, stipulate on young shoots; stipules ovate to lanceolate, 2-6 mm. long, sparingly denticulate; petioles becoming 5-8 mm. long on the large leaves subtending branchlets, mostly pubescent; blades very narrowly elliptical or linear-lanceolate or those on fruiting branchlets narrowly oblanceolate, acute or short acuminate at the very sharp or spinulose apex, acute or short acuminate at the base, narrowing to the very short petiole, 5-7 cm. long, 8-14 mm. wide, the subtending leaves much larger, 8-10 cm. long, 15-20 mm. wide, all closely to remotely and more or less spinulose denticulate, especially near the apex; thinly pubescent, becoming glabrate, the young leaves often silvery silky-villous, finally almost glabrous, green above, paler or occasionally slightly glaucescent beneath.

Aments appearing after the leaves, usually clustered, one terminal and 2-5 younger lateral at the ends of leafy branchlets 5-10 cm. long; pistillate aments 3-7 cm. long, 10-15 mm. wide; ovary silvery villous; capsule lanceolate, 5-7 mm. long, brown, villous to thinly villous to glabrate or wholly glabrous in age; style and stigmas together about 1-1.5 mm. long (difficult to determine how much is style), style divided usually to the base, stigmas also divided to the base, scales lanceolate or elliptical, 2.5-3.5 mm. long, sometimes shallowly erose-dentate at the apex, yellow, 3-5-striate, thinly pubescent when expanding to glabrate or glabrous in age (obovate before anthesis).

Staminate aments clustered as the pistillate, 4-5 cm. long; scales as in the pistillate ament; stamens 2; filaments densely pubescent below and thinly so toward the apex, anthers about 1 mm. long.

The exact identity of this plant is uncertain. The descriptions given by NUTTALL of his seven new species in § LONGIFOLIAE are often meager. Frequently, too, there is very little difference in the series of characters assigned



FIG. 3.—*Salix fluviatilis* (?) Nutt.: portions of two fruiting twigs, collected by Howell in Multnomah County, Oregon, July, 1875 (specimens in Bebb Herb., Field Museum of Natural History; left FBb 6575; right, FBb 6576); nat. size.

to two or more separate species. There is some confusion, also, in the types and cotypes of some species. The plant here provisionally referred to *S.*

fluviatilis Nutt. is the species which has been called *S. sessilifolia* by many authors and is so named in most herbaria. It is the species described as *S. sessilifolia* by ROWLEE in his revision of the LONGIFOLIAE. No specimen of NUTTALL'S collecting is known to exist. The species is quite different from the true *S. sessilifolia*. It is closely related to *S. melanopsis* Nutt., a species described from old Fort Hall, near Pocatello, Idaho. It resembles that species in the broad green leaves (fig. 3), often slightly glaucous beneath, and in the extremely long and glabrate or glabrous scales. It differs from *S. melanopsis*, however, in the much longer, acute capsule, initially pubescent, and in the elongated style and stigmas. The style and stigmas, indeed, are very similar to those of true *S. sessilifolia*. It agrees with the brief description of *S. fluviatilis* in the spinulose-serrate, finally glabrous leaves. The capsules, however, are not normally glabrous but sometimes become entirely glabrous in age. The stigmas, also, apparently are not sessile, as NUTTALL records for *S. fluviatilis*. The present species seems to be confined to the lower part of the Willamette Valley and adjacent Columbia River. The type locality for *S. fluviatilis* is "the immediate border of the Oregon (Columbia), a little below its confluence with the Wahlamet." The writer plans to visit the type locality during the present season.

SPECIMENS EXAMINED.—OREGON: Multnomah County: On river banks near water; *Joseph Howell* (145?), July 1875 (FbB 6575, 6576); July 1876 (F 206534); "Oregon, *Howell*" (FbB 4858); *T. J. Howell*, July 1877, distributed by *G. C. Woolson*, no. 362 (G); the first three collections cited above are probably all one and the same thing but do not bear the same full label; Corbett, *F. A. Walpole* 1032, April 29, 1900 (N); Columbia River bottoms: *Thomas J. Howell*, July 1880, as "*Salix sessilifolia*" Nutt. (B, F 206860; FbB 4859; N); Sandbars, Columbia River, *Thomas J. Howell*, July 1880 (as *S. sessilifolia* var. *villosa* Nutt., F 206859; FbB 4860; N, 19244); Portland, between Portland and the mouth of the river, *E. P. Sheldon* 10862, July 10, 1902 (N, 2 sheets); Portland, *Sheldon* 12029, July 9, 1903 (F 216993).

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